

Wetland Monitoring Plan

U. S. Steel Minntac West Tailings Basin Seepage Collection Project

Prepared for
U. S. Steel Minnesota Ore Operations - Minntac

November 2016

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Contents

1.0	Introduction	1
2.0	Monitored Wetland Communities	2
3.0	Wetland Monitoring	5
3.1	Hydrology Monitoring	5
3.2	Boundary Monitoring	6
3.3	Vegetation Monitoring	6
3.4	Monitoring Schedule	6
4.0	Indirect Wetland Impact Determination	8
5.0	References	9

List of Tables

Table 2-1. Wetland community types based on recent delineation compared to historical conditions

List of Figures

Figure 1	West Side Seep Locations
Figure 2A	Northern Wetland Communities – 1961 Aerial Photo
Figure 2B	Central Wetland Communities – 1961 Aerial Photo
Figure 2C	Southern Wetland Communities – 1961 Aerial Photo
Figure 3A	Northern Wetland Monitoring – 2016 Aerial Photo
Figure 3B	Central Wetland Monitoring – 2016 Aerial Photo
Figure 3C	Southern Wetland Monitoring – 2016 Aerial Photo

1.0 Introduction

United States Steel Corporation (U. S. Steel), Minnesota Ore Operations – Minntac Mine (Minntac) is a taconite mining and processing operation located near Mountain Iron, St. Louis County, Minnesota. The Minntac Tailings Basin West Seepage Collection Project (Project) is located along the west side of the Minntac tailings basin dike. As required by a June 9, 2011 Schedule of Compliance (SOC) agreement between U. S. Steel and the Minnesota Pollution Control Agency (MPCA), a surface seepage collection and return system for the west side of the tailings basin was designed and is expected to be constructed in 2017, pending receipt of necessary permits and approvals. The purpose of the Project is to collect surface seepage water from the west tailings basin perimeter dike and return it to the basin to reduce the impact of surface seepage on downstream water quality.

Regulatory agencies have expressed concern that the seepage collection system could reduce flow to downgradient wetlands, west of the seepage collection system. Therefore, wetland monitoring has been required by the Minnesota Department of Natural Resources (MDNR) in a Notice of Decision for the Minnesota Wetland Conservation Act (WCA). In addition, the Minnesota Pollution Control Agency (MPCA) included a condition as part of the Clean Water Act (CWA) Section 401 Certification for the project requiring wetland hydrology and vegetation monitoring, and the US Army Corp of Engineers (USACE) has requested a plan.

On behalf of U. S. Steel, Barr Engineering Company (Barr) prepared this wetland monitoring plan for wetlands that may be indirectly impacted by the Project. Monitoring will occur in six wetlands that may be indirectly impacted near the Project, as shown in **Figures 1 through 3**. The monitoring protocol described in this document will continue for at least two years post construction of the Seepage Collection project. Monitoring will continue until the USACE and MDNR have provided written approval to terminate monitoring.

This plan includes a discussion about the historical wetland types present in the Project area in Section 2 to guide the monitoring approach and develop thresholds for impact determinations. Section 3 is a description of the proposed monitoring activities, including the collection of baseline data. Section 4 identifies the thresholds for impact determinations and for discontinuation of monitoring if no such impacts are found.

2.0 Monitored Wetland Communities

The wetlands to be monitored are downgradient of the tailings basin perimeter dike on the west side of the basin. Many of the wetlands adjacent to the tailings basin were delineated in 2012 and 2014, with some additional revisions in 2015. Water discharges from the tailings basin via surface seeps into the wetlands along the west side of the basin through the toe of the embankment. Deeper groundwater seepage originating in the tailings basin also enters the wetlands downgradient of the perimeter dike. The seeps from the tailings basin have caused many of the wetlands to become wetter than historical, natural wetlands and may have altered the wetland community types. **Figure 2** shows outlines of the recently delineated wetlands over a historical aerial photo of the area from 1961, before the tailings basin was constructed. It is difficult to determine exact wetland boundaries from this photo, but it is clear that there was less standing water compared to more recent aerial photos, as shown in **Figure 3**.

The wetland communities from the delineations are shown in the **Table 2-1** below compared to the estimated wetland community type based on the 1961 aerial photos (**Figure 2**). Of the 27 wetlands reviewed, 10 appear to have a similar hydrologic regime in 2014 as they had in the 1961 aerial photo. All wetlands, or portions thereof, reviewed from the 1961 aerial photo appeared to have had a saturated hydrologic regime, in which the soil surface was likely saturated. This would be typical in hardwood/conifer swamp and shrub swamp, which were the predominant wetland communities in the area prior to the construction of the tailings basin and nearby roads. It is likely that there was little or no ponding in most of the wetlands during the growing season; three wetlands adjacent to streams appeared to receive some surface inundation. In 2014, 17 wetlands had some degree of surface inundation.

The tailings basin appears to be the primary land use change in the area that likely caused the changes to these wetland communities; though new roads and beaver dams may have caused some areas of inundation. Discharge from the seeps along the tailings basin was likely a factor resulting in increased water in some wetlands.

The goal of the project is to contain a portion of this flow within the tailings basin to reduce the potential for impacts to downstream water quality. Sheet pile will be installed into the native soil only far enough to minimize back draining the wetland into the collection system while allowing existing groundwater flows to contribute to the downgradient wetland hydrology. The Project is designed to collect discharge of surface seepage from the tailings basin to the Dark River Watershed, and will reduce overall total seepage flow from the tailings basin into the downgradient wetlands to the west; however, it is unlikely to reduce wetland hydrology to levels below those present prior to the tailings basin construction. The hydrologic regime may return to levels more similar to natural, historical levels, but it is unlikely to result in a reduction in overall wetland area, relative to natural, historical conditions.

The proposed wetland monitoring is designed to detect potential changes to the hydrology in downgradient wetlands and determine the extent of Project impacts on downgradient wetlands. Baseline monitoring before Project implementation will likely be minimal; however, the appropriate baseline conditions for these wetlands should be based on the natural, historical wetlands present in the area prior to the tailings basin. It is expected the wetlands will continue to be at least as wet as the conditions in

1961, based on those community types; most are expected to remain wetter, more similar to the 2014 community types. Wetland types and hydrologic regimes shown in **Table 2-1** are based on 1961 conditions and will be used as presumed baseline conditions.

Table 2-1. Wetland community types based on recent delineation compared to historical conditions

Sub-Catchment (Figures)	Wetland Name	2014 Wetland Community		1961 Estimated Historic Wetland Type	
		Eggers and Reed	Hydrologic Regime	Eggers and Reed	Hydrologic Regime
4 (2A & 3A)	32A	Open water	Inundated	Shrub / Hardwood swamp	Saturated
	32B	Deep marsh	Inundated	Shrub / Hardwood swamp	Saturated
	32C	Hardwood swamp	Saturated	Shrub / Hardwood swamp	Saturated
	33A	Shrub swamp	Saturated	Shrub / Hardwood swamp	Saturated
	33C	Hardwood swamp	Saturated	Shrub / Hardwood swamp	Saturated
3 (2A & 3A)	5	Shrub swamp	Saturated / Temp. Inundation	Shrub swamp/ Non-wetland	Saturated/Dry
	6	Hardwood swamp	Saturated	Hardwood swamp/ Non-wetland	Saturated/Dry
	7A	Hardwood swamp	Saturated	Shrub swamp	Saturated
	7B	Shrub swamp	Saturated / Temp inundation	Shrub / Hardwood swamp	Saturated
	8	Hardwood swamp	Saturated / Temp inundation	Hardwood swamp	Saturated
2 (2B & 3B)	10A/B	Shallow marsh / Hardwood swamp	Shallow Inundation/ Saturated	Sedge meadow/ Shrub / Conifer/ Hardwood swamp	Saturated / Temp inundation
	11D	Deep marsh/ Hardwood swamp	Inundated / Saturated	Shrub / Hardwood swamp	Saturated
	13A	Hardwood swamp	Saturated	Hardwood swamp Portions non-wetland	Saturated/Dry
	13B	Open water	Inundated	Hardwood swamp Portions non-wetland	Saturated/Dry
	13D	Deep marsh	Inundated	Shrub / Hardwood swamp Portions non-wetland	Saturated/Dry
	13E	Open water	Inundated	Shrub / Hardwood swamp	Saturated
	13F	Hardwood swamp	Saturated	Hardwood swamp	Saturated
	13G	Shrub swamp	Saturated	Hardwood swamp	Saturated

Sub-Catchment (Figures)	Wetland Name	2014 Wetland Community		1961 Estimated Historic Wetland Type	
		Eggers and Reed	Hydrologic Regime	Eggers and Reed	Hydrologic Regime
1 (2C & 3C)	23A/C	Deep marsh	Inundated	Shrub / Hardwood swamp	Saturated
	23B	Shrub swamp	Saturated	Shrub / Hardwood swamp	Saturated
	26	Deep marsh/ Open water	Inundated	Shrub / Hardwood swamp	Saturated
	34A	Open water	Inundated	Hardwood swamp	Saturated
	34B	Shrub swamp	Saturated	Sedge meadow / Hardwood swamp	Saturated / Temp inundation
	34C	Shallow marsh	Shallow Inundation	Hardwood swamp	Saturated
	35A	Open water	Inundated	Sedge meadow/Hardwood swamp	Saturated / Temp inundation
	35B	Deep marsh	Inundated	Hardwood swamp	Saturated
	35C	Shrub swamp	Saturated / Temp inundation	Hardwood swamp	Saturated
	35D	Fresh (wet) meadow	Saturated	Hardwood swamp	Saturated

3.0 Wetland Monitoring

To determine whether the Project will result in impacts to downgradient wetlands, U. S. Steel will implement wetland monitoring beginning soon after plan approval from appropriate regulatory agencies. Wetland monitoring will include monitoring of hydrology, boundaries, and vegetation in representative wetlands as described below.

The Project will include the construction of four sub-catchments, which will be composed of a combination of sheet piles and pumps to collect and return surface seepage back to the tailings basin (**Figure 1**). Monitored wetlands are downgradient (west) of the sub-catchments, including at least one representative wetland near each. The wetlands proposed are those that appear to be most likely affected by changes to the surface seepage. Three wetlands are proposed for monitoring near Sub-catchment 1, because those wetlands are each part of a separate sub-watershed and, currently, receive water from separate surface seeps. Monitoring locations are shown in **Figure 3** and as follows (north to south):

- **Monitoring Location 33C** is in wetland 33C (hardwood swamp) near Sub-catchment 4 (Figure 3A)
- **Monitoring Location 7B** is in wetland 7B (shrub swamp) near Sub-catchment 3 (Figure 3A)
- **Monitoring Location 13A** is in wetland 13A (hardwood swamp) near Sub-catchment 2 (Figure 3B)
- **Monitoring Location 23x** is outside the area delineated, west of wetland 23 near Sub-catchment 1 (Figure 3C). This is expected to be a sedge meadow community.
- **Monitoring Location 26x** is outside the area delineated, west of wetland 26 near Sub-catchment 1 (Figure 3C). This is expected to be a sedge meadow community.
- **Monitoring Location 34B** is just outside the area delineated in wetland 34B (deep marsh) near Sub-catchment 1 (Figure 3C).

3.1 Hydrology Monitoring

Shallow water table monitoring wells will be installed in accordance with USACE (2005) standards. The wells will be installed in six representative wetlands downgradient of the seep collection system. In addition, two reference wetland wells are currently being monitored for the Minntac Mine Extension indirect wetland impact monitoring project. The reference wells are located outside of the anticipated impact area for the Project, to the northwest. The reference wells will be used to provide data to determine possible local or regional trends not caused by the Project.

The monitoring program will focus on the six representative wetland locations where potential indirect impacts may occur downgradient of the Project (**Figure 1**). It is anticipated that one shallow water table monitoring well will be installed at each monitoring location (**Figure 3**). Each well will have an automated data logger that will record water levels every hour. The data loggers will be removed near the end of the growing season and replaced early in the growing season the following year. Manual measurements in each well will be used for quality assurance and quality control; the water levels will be measured in each

of these wells at least once during the growing season. Monitoring well construction methods will be consistent with the *Technical Standard for Water-Table Monitoring of Potential Wetland Sites* (USACE 2005); boring and well installation logs will be provided with the first monitoring report.

3.2 Boundary Monitoring

In each of the six wetlands, data will be collected for at least one wetland delineation sample point using the methods described in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (USACE 2012). At each datapoint, ecologists will document vegetation, soils, and hydrology. The location of the sample point will be mapped with a GPS with sub-meter horizontal accuracy to allow return to the same location for future sampling events after implementation of the Project.

Adjacent to the delineation sampling point, approximately 400 feet of the representative portions of the wetland boundary will be mapped for comparison to future delineations after implementation. Data collected from the sample points and wetland boundary will be provided with the first monitoring report at the end of the year after the Project is completed. This segment of the boundary will be re-delineated during post-construction monitoring.

3.3 Vegetation Monitoring

Vegetation monitoring will occur within the wetland community that coincides with the hydrology monitoring well. Vegetation monitoring will be completed using the timed-meander survey method in one Assessment Area (AA) located near each monitoring well location. Each AA will have a boundary based on community boundaries. The AAs will be permanently established and utilized for each year of vegetation monitoring, though they may be modified to account for re-mapping of community types. Data from the vegetation monitoring will be used to complete a Floristic Quality Assessment (FQA) as recommended by the MPCA. The FQA will primarily rely on the weighted coefficient of conservatism (wC), a metric for rating the quality of wetland vegetation. Changes in the wC value will be used to assess possible changes to the wetland.

3.4 Monitoring Schedule

Hydrology monitoring will begin within 4 weeks of approval of this plan. However, if approvals are received during the non-growing season, monitoring will begin at the start of the following growing season. The first task will be installation of the shallow water table monitoring wells. Automatic data loggers will be installed in each well and water table information will be logged on an hourly basis during each growing season. Wetland boundary monitoring will also be completed as soon as feasible after plan approval to collect baseline data before Project implementation. Baseline data will be reported at the end of the year during which the Project is constructed.

Wetland monitoring will continue for at least two years after completion of Project construction. Hydrology monitoring will continue for at least two growing seasons after completion of Project construction to determine potential indirect impacts to wetlands that may be caused by the Project. Post-

construction wetland boundary and vegetation monitoring will be completed two years after the completion of Project construction. After two years, there will be a review of the need for future monitoring and the duration and frequency of that monitoring. If necessary, future monitoring will continue, at most, annually for hydrology monitoring and once every three years for the vegetation and boundary monitoring. The monitoring will continue until there is written approval from the USACE and MDNR that monitoring is no longer necessary.

A monitoring report will be submitted to the USACE and MDNR on an annual basis, by January 31 of each following year (i.e. the report for 2017 data shall be submitted by January 31, 2018). The report shall contain well data, summary tables and graphs, annual precipitation by day and month, and a summary and analysis of the monitoring data. During wetland boundary monitoring years, the report will include data sheets from each of the monitoring data points and a map showing the wetland boundary relative to previously delineated boundaries in the same area.

If it is determined, in the future, that certain data are not providing useful information, the monitoring may be modified with the concurrence of the USACE and MDNR. Monitoring may be discontinued at individual wells or for the entire system when it is determined that monitoring is no longer necessary. Discontinuation of monitoring at certain wells or all wells would be requested by U. S. Steel and must be approved in writing by the USACE and MDNR before wells or data loggers would be removed.

4.0 Indirect Wetland Impact Determination

The hydrology monitoring data collected as part of this monitoring program will be evaluated to determine if adverse, indirect wetland impacts occur as a result of the Project. Criteria that may indicate an adverse, indirect wetland impact are based on the following:

1. Monitoring data demonstrate that the area no longer meets the wetland hydrology criteria as defined in Technical Standard for Water-Table Monitoring of Potential Wetland (USACE 2005).
2. Wetland boundary monitoring indicates a measurable reduction in size of the wetland area relative to the historical wetland extent, supported by wetland hydrology monitoring data, and inconsistent with changes in the reference wetlands.
3. There is a change in wetland community type, such that the hydrology of the new wetland community is drier than would be expected based on the historical wetland community type..
4. For the vegetation monitoring, a reduction in the wC of more than 1 point in the FQA based on the timed-meander surveys. The wC may be affected by shifting wetland community types, which often results in a different suite of species. A shift to an historical wetland community type or historical wetland hydrologic regime for a given wetland would not be considered an adverse impact, even if there is a lower wC.
5. Other information will be used to assess the potential reduction in hydrology including, but not limited to: the wetland delineations of these areas, antecedent precipitation, and reference wetland hydrology.

Should adverse, indirect wetland impacts be identified during the monitoring program, an estimation of impacts would be included in the monitoring report in the year that they are first detected. The report would include a discussion of the likely causes of the impacts and a determination if it was due to the Project or related activities. The monitoring data will be compiled in a report including methods, results, and an evaluation of potential adverse indirect wetland impacts, which will be submitted to the USACE and MDNR by January 31 of each year following each growing season.

5.0 References

- USACE. 2005. Technical Standard for Water-Table Monitoring of Potential Wetland Sites. ERDC TN-WRAP-05-2, June 2005.
- USACE. 2006. Water Table Monitoring Project Design. ERDC TN-WRAP-06-2, January 2006.
- USACE. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Figures

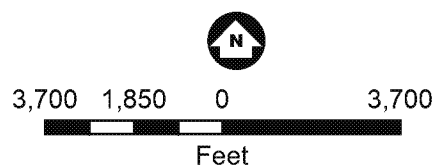
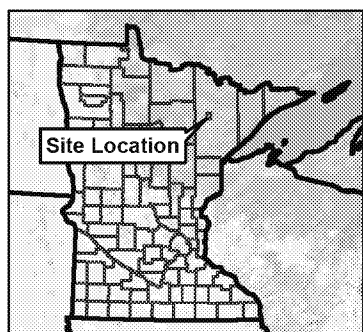
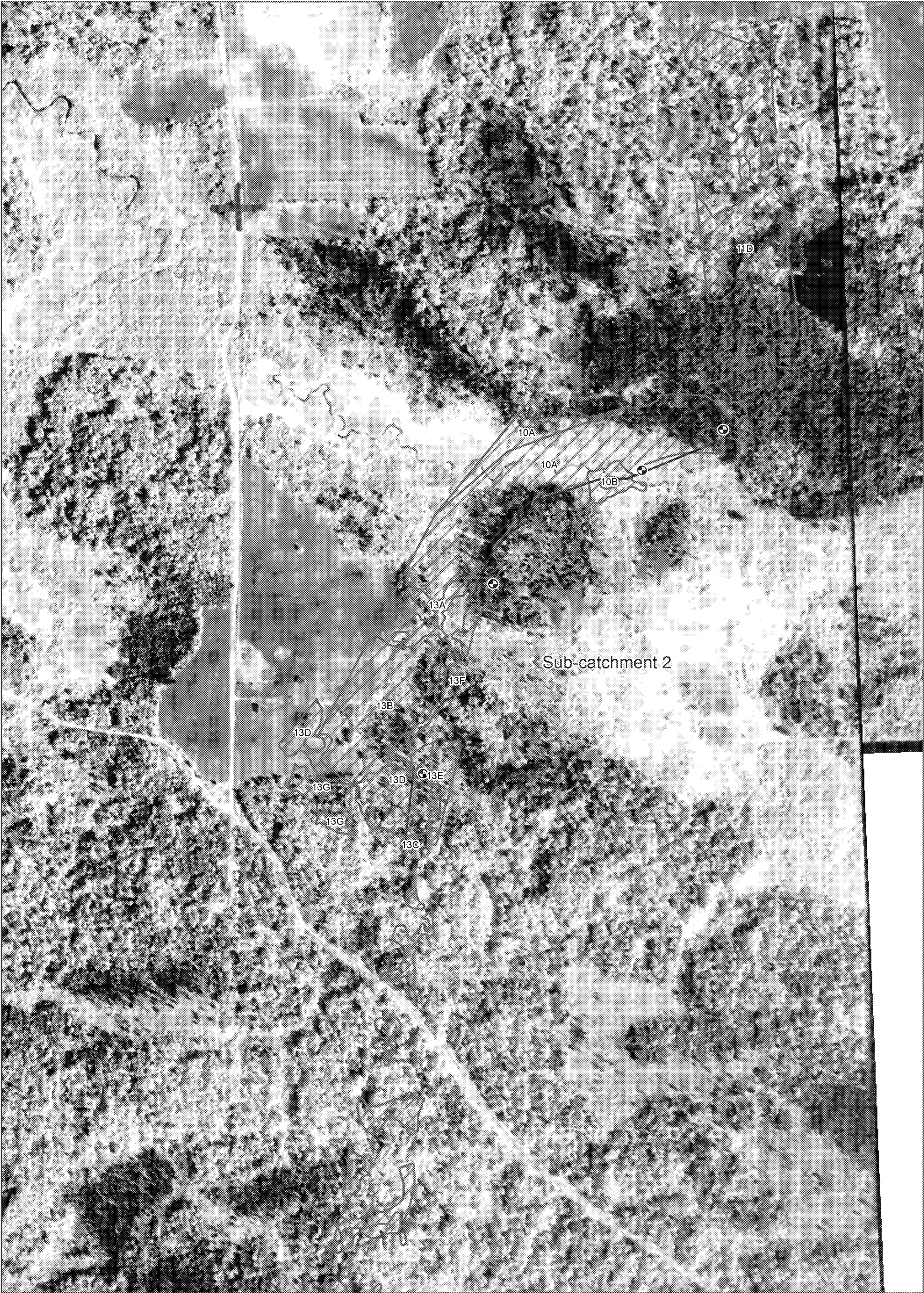


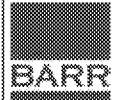
Figure 1

WEST SIDE
SEEP LOCATIONS
U. S. Steel - Minntac
St. Louis County, MN






Imagery: MN DNR (1961)



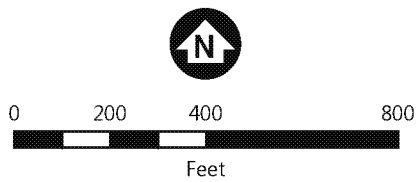
Seep Location



Sheet Piling

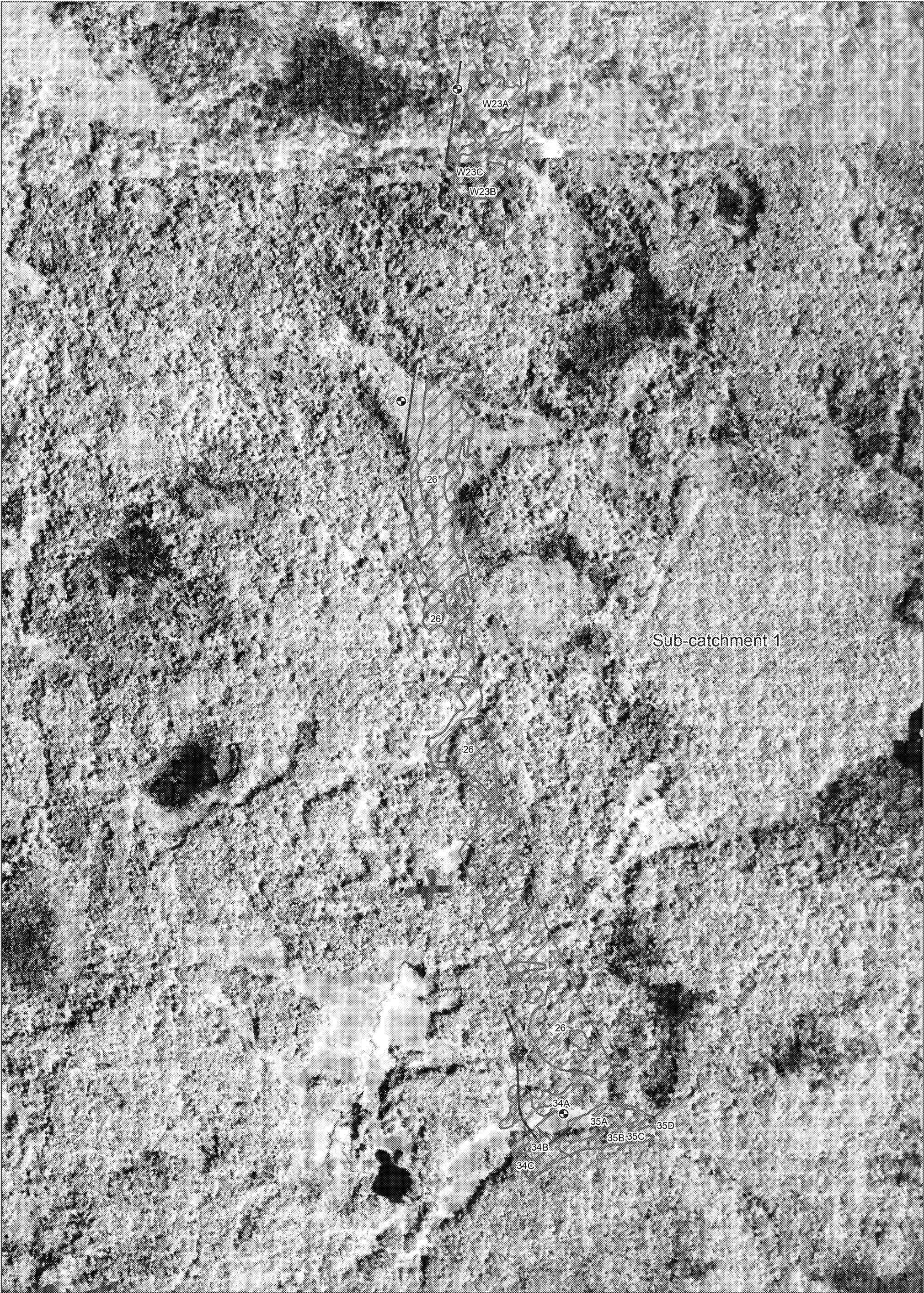






2014 NTS Wetland Delineations



CENTRAL WETLAND COMMUNITIES
1961 AERIAL PHOTO
U. S. Steel - Minntac
St. Louis County, MN

FIGURE 2B







Seep Location

Sheet Piling Locations

2014 NTS Wetland Delineations

Imagery: MN DNR (1961)

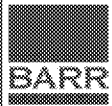


0 250 500 1,000
Feet





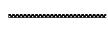



SOUTHERN WETLAND COMMUNITIES
1961 AERIAL PHOTO
U. S. Steel - Minntac
St. Louis County, MN



FIGURE 2C





Imagery: St. Louis County (2016)

	Proposed Wetland Monitoring Locations		Freshwater Emergent Wetland
	Seep Location		Freshwater Forested/Shrub Wetland
	Sheet Piling Locations		Freshwater Pond
	2014 NTS Wetland		Lake




NORTHERN WETLAND MONITORING
2016 AERIAL PHOTO
U. S. Steel - Minntac
St. Louis County, MN


FIGURE 3A




St. Louis County, MN - Enterprise GIS



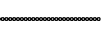
Imagery: St. Louis County (2016)




Proposed Wetland Monitoring Locations



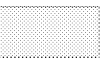
Seep Location



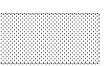
Sheet Piling Locations



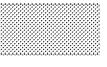
2014 NTS Wetland Delineations




Freshwater Emergent Wetland




Freshwater Forested/Shrub Wetland



Freshwater Pond



Lake



0 200 400 800
Feet

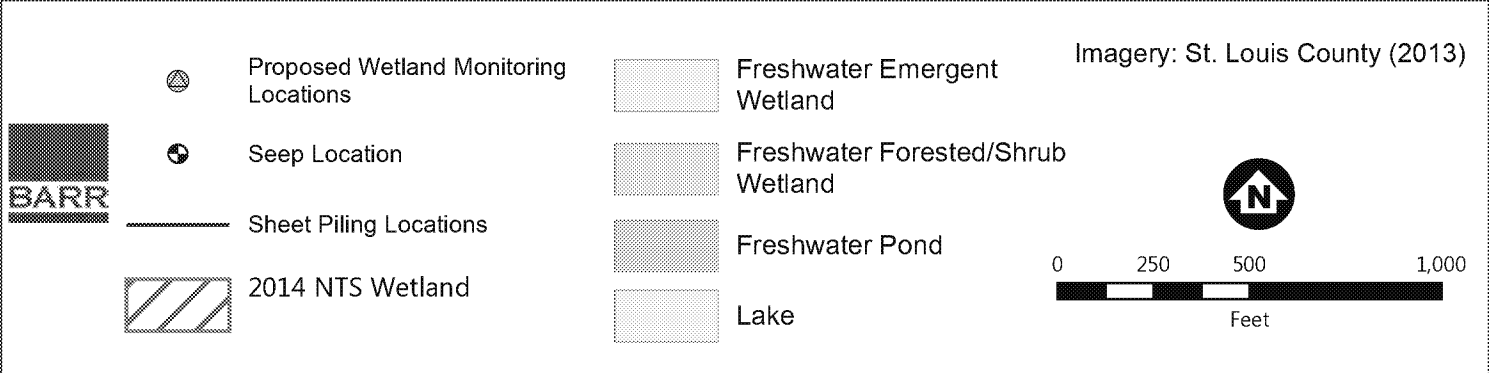
CENTRAL WETLAND MONITORING
2016 AERIAL PHOTO
U. S. Steel - Minntac
St. Louis County, MN

FIGURE 3B

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St. Louis County, MN - Enterprise GIS



SOUTHERN WETLAND MONITORING
2013 AERIAL PHOTO
U. S. Steel - Minntac
St. Louis County, MN

FIGURE 3C